



25/appeal Brief
Hawkins

PATENT APPLICATION 2/12/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Docket No: Q60072

Kyoko HIGASHINO, et al.

Appln. No.: 09/625,993

Group Art Unit: 2834

Confirmation No.: 8492

Examiner: J. Gonzalez

Filed: July 26, 2000

For: STATOR FOR AN AUTOMOTIVE ALTERNATOR

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APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Commissioner for Patents
Washington, D.C. 20231

Sir:

In accordance with the provisions of 37 C.F.R. § 1.192, Appellant submits the following:

I. REAL PARTY IN INTEREST

The real party in interest is the assignee, Mitsubishi Denki Kabushiki Kaisha.

II. RELATED APPEALS AND INTERFERENCES

There are no other related appeals or interferences known to Appellant which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending Appeal.

III. STATUS OF CLAIMS

When the final Office Action was issued on July 8, 2002, claims 1-5 and 9-18 were pending in the application and were all finally rejected. A copy of these claims appears in the attached appendix. The Examiner's rejections are stated in section VI. of this Brief.

IV. STATUS OF AMENDMENTS

Subsequent to the Final Office Action dated July 8, 2002, an Amendment was filed on September 26, 2002, amending claim 10. In the Advisory Action mailed on October 17, 2002, the Examiner indicated that this amendment would not be entered because it raised new issues. Therefore, all Amendments have not been entered.

V. SUMMARY OF THE INVENTION

The present invention relates to an alternator driven by an internal combustion engine, and in particular, relates to a stator for an automotive alternator mounted in a vehicle such as a passenger car or truck. *See* page 1, first full paragraph. In certain embodiments of the present invention, stator coils 23 are installed during the manufacture of a stator core 122 while the stator core 122 is flat or somewhat curved, following which the stator core 122 is bent into a final annular shape. The present invention is not specific to the number of slots 125 in the stator core 122, but certain embodiments are specific to the mechanical and electrical angles defined by the respective slots 125 and/or the method of manufacturing and installing the stator coils 23 in the stator core 122.

During the manufacturing process of forming the rounded (annular) stator core 122 in the embodiments that pertain thereto, end surfaces 224b are brought together and welded. *See* paragraph bridging pages 6 and 7 and weld 224b in Fig. 7. This forms the annular shape shown, and facilitates the mounting of the stator coils 23 on the stator core 122 (i.e. the stator coil

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installation) in a manner that leads to higher quality and lower cost. Furthermore, the installation or "connecting operation" is simplified and the joining properties are improved.

The primary purpose of the specific mechanical and electrical angles defined by respective slots 125 of the present invention, in the embodiments that pertain thereto, is to suppress or reduce electromagnetically induced vibration ascribable to the claw-shaped magnetic pole structure of a rotor common in the art. One embodiment achieves this purpose by alternating between two different mechanical and electrical angles between respective slots. *See, e.g.,* Figs. 4 and 5.

Certain embodiments of the present invention obtain predetermined mechanical and electrical angles defined by respective slots 125 by varying the widths of the teeth 224c and 224d that define the slots 125. *See* Fig. 7. Certain other embodiments obtain the predetermined mechanical and electrical angles defined by respective slots 125 by varying the lengths of projections 124a and 124b extending in a circumferential direction from the teeth 124 defining the slots 125.

VI. ISSUES

**A. Whether claims 10 and 11 are indefinite under 35 U.S.C. § 112,
second paragraph;**

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B. Whether claim 1 is unpatentable under 35 U.S.C. § 103(a) over Huang et al. (U.S. Patent No. 5,592,731) in view of Beard (U.S. Patent No. 2,502,121);

C. Whether claim 2 is unpatentable under 35 U.S.C. § 103(a) over Huang in view of Beard, and further in view of Maruyama et al. (U.S. Patent No. 6,194,800);

D. Whether claims 9-11 and 15 are unpatentable under 35 U.S.C. § 103(a) over Huang in view of Beard and Muller (U.S. Patent No. 5,834,873); and

E. Whether claims 3-5, 12-14 and 16-18 are unpatentable under 35 U.S.C. § 103(a) over Huang in view of Beard and in view of Muller, and further in view of Maruyama, and still further in view of ordinary skill in the art.

VII. GROUPING OF CLAIMS

With respect to Issue A, Appellant submits that claim 10 stands or falls alone and claim 11 stands or falls alone.

With respect to Issue B, Appellant submits that claim 1 stands or falls alone.

With respect to Issue C, Appellant submits that claim 2 stands or falls alone.

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With respect to Issue D, Appellant submits that claim 9 stands or falls alone, claim 10 stands or falls alone, claim 11 stands or falls alone, and claim 15 stands or falls alone.

With respect to Issue E, Appellant submits that claims 3-5, 12-14, and 16-18 stand or fall together.

VIII. ARGUMENTS

A. Claims 10 and 11 are not indefinite under 35 U.S.C. § 112, second paragraph

Claim 10, depending from independent claim 9, defines a stator for an automotive alternator according to the claimed combination. The pertinent portion of claim 10 is set forth hereinafter for convenience. Claim 10 recites that, "contact surfaces of said stator core, when said stator core is connected as an annular shape, are formed by dividing a wide tooth among said teeth of alternating widths in a circumferential direction with a substantially orthogonal surface."

Regarding claim 10, the Examiner inquires in the final Office Action dated July 8, 2002 (hereinafter the "Office Action") whether the orthogonal surface is the structure splitting the wide tooth. Clearly, the orthogonal surface is at the split point of the wide tooth. This is shown by reference character 224b in Fig. 7, and described in the last full paragraph on page 8 of the Application. Therefore, Appellant respectfully asserts that claim 10 satisfies the definiteness

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requirement of 35 U.S.C. § 112 and clearly describes the structure referred to in the specification and drawings..

Claim 11 also depends from independent claim 9 and defines a stator for an automotive alternator according to the claimed combination. The pertinent portion of claim 11 is set forth hereinafter for convenience. Claim 11 recites that, “a size of an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions alternates from one interval to the next.”

Regarding claim 11, the Examiner questions what alternates, the size of the interval (singular) or the air gaps (plural). The Examiner repeats this question from the Non-Final Office Action dated January 30, 2002. Appellant respectfully asserts that the verb tense of the word “alternates” is the verb tense applied to a singular subject. Given that the subject “a size of an interval” is singular and the subject “air gaps” is plural, Appellant asserts that the claim definitely recites that a size of an interval alternates, not the size of the air gaps. The word “alternates” is intended to have its standard dictionary definition. It is not intended to have a specialized, unique or technical meaning. Appellant respectfully asserts that the use of this term in claim 11 is clear and definite and that the claim satisfies the definiteness requirement of 35 U.S.C. § 112.

For at least the foregoing reasons, Appellant respectfully submits that claims 10 and 11 are patentable. The issues raised by the Examiner in connection with the rejection of claims 10

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and 11 under section 112 are separate and distinct issues. Therefore, Appellant submits that claims 10 and 11 stand or fall separately with respect to that rejection.

B. Claim 1 is not unpatentable under 35 U.S.C. § 103(a) over Huang et al. (U.S. Patent No. 5,592,731) in view of Beard (U.S. Patent No. 2,502,121)

Independent claim 1 defines a stator for an automotive alternator according to the claimed combination. The pertinent portion of claim 1 is set forth hereinafter for convenience. Claim 1 includes, "an annular shaped, single piece stator core formed as a lamination of a plurality of sheet-shaped magnetic members, having . . . a first end surface and a second end surface fixed together to form said annular shape. . . ."

Claim 1 recites, "an annular shaped, single piece stator core . . ." (emphasis added). Appellant emphasized repeatedly in responses filed in this Application that the claimed stator core is of a single piece, not multiple pieces. Nevertheless, the Examiner persists in the Office Action in characterizing the claimed stator core as being "made of two pieces fixed together". Appellant submits that the Examiner improperly characterizes the present invention in terms of the prior art over which the present invention is a significant improvement.

The Examiner concedes in the Office Action that Huang requires the stator core to be divided into at least two segments. *See* col. 6, lines 55-58. The Examiner appears to rely in the Office Action on Beard to overcome this conceded deficiency in Huang. However, Beard also

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discloses a stator core divided into at least two segments. *See, e.g.*, Fig. 1. In other words, neither Beard nor Huang disclose a single piece stator core as claimed.

Furthermore, claim 1 recites a “stator core . . . having . . . a first end surface and a second end surface fixed together to form said annular shape. . . .” Conversely, because the stator core of Huang is segmented into an indiscriminate number of separate parts, it cannot be formed as claimed. Rather, the stator core of Huang requires a thermal expansion technique to form an interference fit of the multiple segments. *See* col. 8, line 61 to col. 9, line 13, et. seq. Since Beard teaches two separate stator core segments, Beard shares this deficiency in Huang.

Still further, claim 1 recites, “two sets of three-phase stator coils fitted into said slots. . . .” In contradistinction, Huang teaches a conventional three-phase coil. *See* col. 7, lines 57-58. In no way does Huang teach or suggest “two sets of three phase stator coils fitted into said slots” as claimed. Beard clearly fails to overcome this deficiency in Huang. *See* Figure.

In order to establish a *prima facie* case of obviousness, the Examiner must show that the prior art teaches or suggests all of the claim limitations in the combination as claimed. *See* M.P.E.P. §2142, 3rd paragraph (case citations omitted); and M.P.E.P. § 2143.03 (case citations omitted). For either of the two above-described deficiencies shared by both Huang and Beard, Appellant respectfully submits that the Examiner has not set forth a *prima facie* case of obviousness, since the cited references do not teach or suggest each and every limitation recited in independent claim 1.

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For at least the foregoing reasons, Appellant respectfully submits that claim 1 is patentable.

C. Claim 2 is not unpatentable under 35 U.S.C. § 103(a) over Huang in view of Beard, and further in view of Maruyama et al. (U.S. Patent No. 6,194,800)

Claim 2, depending from independent claim 1, defines a stator for an automotive alternator according to the claimed combination. The pertinent portion of claim 2 is set forth hereinafter for convenience. Claim 2 recites that, “an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions is not the same.”

Claim 2 is allowable based at least on its dependence from Claim 1 for the reasons detailed above.

Further, the Examiner correctly concedes in the Office Action that Huang and Beard do not disclose the limitation recited in claim 2. In order to overcome this deficiency in Huang and Beard, the Examiner relies on Maruyama. However, Maruyama also fails to disclose this limitation.

Referring to Fig. 42 for example, Maruyama discloses air gaps of slot opening portions that have different widths, S_1 and S_2 . However, the interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions is the sum of interval α

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and interval β . Thus, though widths S_1 and S_2 alternate, the sum of intervals α and β , which is the angular separation between air gap center lines, is static. Thus, the interval in the circumferential direction between centers of air gaps of adjacently formed slot opening portions disclosed by Maruyama is static. It does not alternate as claimed. *See* col. 31, lines 2-27 and col. 32, line 44 to col. 33, line 1.

Therefore, Appellant respectfully submits that none of the references applied by the Examiner in the rejection of claim 2, whether taken alone or together, teach or suggest the combination as claimed.

Further, as previously stated, the Examiner must show that the prior art teaches or suggests all of the claim limitations in the combination as claimed in order to establish a *prima facie* case of obviousness. *See* M.P.E.P. §2142, 3rd paragraph (case citations omitted); and M.P.E.P. § 2143.03 (case citations omitted). Appellant respectfully submits that the Examiner has not set forth a *prima facie* case of obviousness, since the cited references do not teach or suggest the limitation recited in dependent claim 2.

For at least the foregoing reasons, Appellant respectfully submits that claim 2 is patentable.

**D. Claims 9-11 and 15 are not unpatentable under 35 U.S.C. § 103(a)
over Huang in view of Beard and Muller (U.S. Patent No. 5,834,873)**

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Claims 9-11 and 15 define a stator for an automotive alternator according to the claimed combinations. The pertinent portions of the claims are set forth hereinafter for convenience.

Independent claim 9, from which claims 10 and 11 depend, includes, “an annular shaped stator core formed as a lamination of a plurality of sheet-shaped magnetic members, having a plurality of teeth defining a plurality of slots extending in axial directions at one side of a yoke at an inner circumference thereof, two sets of three-phase stator coils fitted into said slots, and end surfaces fixed together to complete said annular shape. . . .”

Claim 9 further recites that, “widths of said teeth . . . alternate in size. . . .” Conversely, Huang, and Beard all disclose teeth having uniform widths. Thus, the Examiner correctly concedes in the Office Action that neither Huang nor Beard disclose this limitation. In order to overcome this deficiency in Huang and Beard, the Examiner relies in the Office Action on Muller. However, Muller contains no disclosure whatsoever regarding the width of his teeth. Muller does show projections at the tooth ends which alternate, in pairs, in length. But, the width of the teeth disclosed in Muller are uniform, and, even if that were not the case, in no way does Muller contain a teaching or suggestion of any sort regarding the relative widths of teeth. Therefore, Appellant respectfully submits that Muller shares the deficiency in Huang and Beard conceded by the Examiner. Consequently, Appellant respectfully asserts that reliance on Muller to overcome a conceded deficiency in Huang and Beard regarding the width of teeth is misplaced.

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Still further, claim 9 recites, "two sets of three-phase stator coils fitted into said slots. . . .
." In contradistinction, Huang teaches one three-phase coil, as previously mentioned. In no way does Huang teach or suggest "two sets of three phase stator coils fitted into said slots" as claimed. Beard clearly fails to overcome this deficiency in Huang.

Appellant therefore respectfully submits that the Examiner has not set forth a *prima facie* case of obviousness, since the cited references do not teach or suggest all of the limitations recited in claim 9. Appellant asserts that the combination of Huang, Beard and Muller neither teaches or suggests the combination as claimed in independent claim 9.

Claims 10 and 11 are allowable based at least on their dependence from Claim 9.

Further regarding claim 10, the claim recites that, "contact surfaces of said stator core, when said stator core is connected as an annular shape, are formed by dividing a wide tooth among said teeth of alternating widths in a circumferential direction with a substantially orthogonal surface." Claim 10 is separately patentable owing to this limitation. None of the references teaches a one-piece stator core joined at a split tooth.

Further regarding claim 11, the claim recites, "a size of an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions alternates from one interval to the next." Claim 11 is separately patentable owing to this limitation, for reasons previously presented.

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Independent claim 15 includes, in pertinent part, “a stator core in which a plurality of slots extending in axial directions are formed at an inner circumference thereof, a plurality of teeth defining and partitioning said slots, . . . wherein . . . projections extending in a circumferential direction are formed on said teeth which partition said slots, said projections each having a length, and an interval in a circumferential direction between a center of air gaps of adjacently formed slot opening portions is alternated by alternating said lengths of said projections.”

Prior to the final Office Action, the Examiner previously correctly conceded that Huang does not disclose this limitation. Although the Examiner does not expressly state this concession again in the final Office Action with respect to Beard, Appellant submits that it is readily apparent by a comparison of the Figures of Beard and Huang that Beard shares this deficiency previously conceded by the Examiner with respect to Huang. Neither Beard nor Huang discloses, teaches or suggests projections having alternating lengths.

In order to overcome this deficiency in Huang and Beard, the Examiner relies in the Office Action on Muller. However, Appellant submits that it is readily apparent from the Figures of Muller that the reference discloses alternating pairs of projections, not alternating projections as claimed in claim 15. Muller discloses that the lengths of the projections of each consecutive pair of projections is uniform. In other words, insofar as the claimed alternating

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lengths of projections are concerned, Applicant asserts that Muller merely teaches and suggests alternating pairs of projections, not alternating projections as claimed.

Still further, claim 15 recites, “two sets of three-phase stator coils fitted into said slots. . . .” In contradistinction, Huang teaches only one three-phase winding. In no way does Huang teach or suggest “two sets of three phase stator coils fitted into said slots” as claimed. Beard and Muller clearly fail to overcome this deficiency in Huang.

For at least the foregoing reasons, Appellant submits that the combination of Huang, Beard, and Muller (and Nitta, Burgbacher and the remaining prior art of record) neither teaches nor suggests the combination as claimed in Claim 15.

Therefore, Appellant respectfully submits that claims 9-11 and 15 are patentable.

**E. Claims 3-5, 12-14 and 16-18 are not unpatentable under 35
U.S.C. § 103(a) over Huang in view of Beard and in view of Muller, and
further in view of Maruyama, and still further in view of ordinary skill in the
art**

Claims 3-5, 12-14 and 16-18 are allowable based at least on their dependence from claims 1, 2, 9, 11 and 15 for the reasons stated above.

In addition, the foregoing claims are independently allowable over the cited prior art. Taking claims 3, 12 and 16 as exemplary, these claims are directed to the alternating electrical

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angle defined by adjacent slots. Typical conventional alternators have their slots arranged so as to define regular intervals, in terms of electrical angle, of 30° . In contrast, the slots of the present invention are arranged to define alternating electrical angles. According to claims 3, 12 and 16, the electrical angles alternate between $29^\circ - 31^\circ - 29^\circ - 31^\circ \dots 16^\circ - 44^\circ - 16^\circ - 44^\circ \dots$ none of the cited prior art shows a similar arrangement. Further claims in this group define more narrow ranges or exact values for the alternating angles. None of these claims find any responsive disclosure in the cited prior art.

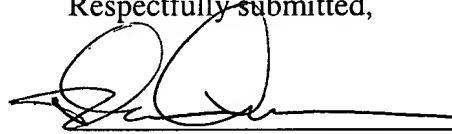
For at least the foregoing reasons, Appellant respectfully submits that claims 3-5, 12-14 and 16-18 are patentable.

The present Brief on Appeal is being filed in triplicate. Unless a check is submitted herewith for the fee required under 37 C.F.R. §1.192(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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PATENT TRADEMARK OFFICE

Date: February 7, 2003

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APPENDIX

CLAIMS 1-5 AND 9-18 ON APPEAL:

1. A stator for an automotive alternator, said stator comprising:

an annular shaped, single piece stator core formed as a lamination of a plurality of sheet-shaped magnetic members, having a plurality of teeth defining a plurality of slots extending in axial directions at one side of a yoke at an inner circumference thereof, two sets of three-phase stator coils fitted into said slots, and a first end surface and a second end surface fixed together to form said annular shape, wherein

2 slots are provided for each phase of said stator coils and each magnetic pole and the total number of the slots is 72 or more.

2. A stator for an automotive alternator according to Claim 1, wherein an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions is not the same.

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3. A stator for an automotive alternator according to Claim 2 characterized in that, said interval of slot opening portions is a repeated electrical angle of α degrees and $(60-\alpha)$ degrees, and said α degrees is in a range of from 16 to 29 degrees.

4. A stator for an automotive alternator according to Claim 2 characterized in that, said interval of slot opening portions is a repeated electrical angle of α degrees and $(60-\alpha)$ degrees, and said α degrees is in a range of from 22 to 24 degrees.

5. A stator for an automotive alternator according to Claim 2 characterized in that, said interval of slot opening portions is a repeated electrical angle of 24 degrees and 36 degrees.

9. A stator for an automotive alternator, said stator comprising:

an annular shaped stator core formed as a lamination of a plurality of sheet-shaped magnetic members, having a plurality of teeth defining a plurality of slots extending in axial directions at one side of a yoke at an inner circumference thereof, two sets of three-phase stator coils fitted into said slots, and end surfaces fixed together to complete said annular shape, wherein

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2 slots are provided for each phase of said stator coils and each magnetic pole and the total number of the slots is 72 or more, and

wherein widths of said teeth which define said slots alternate in size in a circumferential direction.

10. The stator for an automotive alternator according to Claim 9 wherein contact surfaces of said stator core, when said stator core is connected as an annular shape, are formed by dividing a wide tooth among said teeth of alternating widths in a circumferential direction with a substantially orthogonal surface.

11. The stator for an automotive alternator according to Claim 9 wherein a size of an interval in the circumferential direction between a center of air gaps of adjacently formed slot opening portions alternates from one interval to the next.

12. The stator for an automotive alternator according to Claim 11 wherein said interval of slot opening portions is an alternating electrical angle of α degrees and $(60 - \alpha)$ degrees, and said α degrees is in a range from 16-29 degrees.

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13. The stator for an automotive alternator according to Claim 11 wherein said interval of slot opening portions is an alternating electrical angle of α degrees and $(60 - \alpha)$ degrees, and said α degrees is in a range of from 22 to 24 degrees.

14. The stator for an automotive alternator according to Claim 11 wherein said interval of slot opening portions is an alternating electrical angle of 24 degrees and 36 degrees.

15. A stator for an automotive alternator, said stator comprising:

a stator core in which a plurality of slots extending in axial directions are formed at an inner circumference thereof, a plurality of teeth defining and partitioning said slots, and two sets of three-phase stator coils which are fitted into said slots, wherein

2 slots are provided for each phase of said stator coils and each magnetic pole and the total number of the slots is 72 or more, and

projections extending in a circumferential direction are formed on said teeth which partition said slots, said projections each having a length, and an interval in a circumferential direction between a center of air gaps of adjacently formed slot opening portions is alternated by alternating said lengths of said projections.

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16. The stator for an automotive alternator according to Claim 15 wherein said interval of slot opening portions is an alternating electrical angle of α degrees and $(60 - \alpha)$ degrees, and said α degrees is in a range from 16-29 degrees.

17. The stator for an automotive alternator according to Claim 15 wherein said interval of slot opening portions is an alternating electrical angle of α degrees and $(60 - \alpha)$ degrees, and said α degrees is in a range of from 22 to 24 degrees.

18. The stator for an automotive alternator according to Claim 15 wherein said interval of slot opening portions is an alternating electrical angle of 24 degrees and 36 degrees.